MULTIMEDIA UNIVERSITY STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

BST1034 – STATISTICS FOR MANAGERS

(All sections / Groups)

2 MARCH 2020
9.00 a.m.- 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **8** printed pages excluding the cover page, with **4** questions only.

2. Attempt **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Students are allowed to use non-programmable scientific calculators (without restriction).

4. All necessary workings must be shown and please write all your answers in the answer booklet provided.

QUESTION 1

(a) Consider the following set of a sample data:

320	320	330	320	320	330	500	320	320	310
300	320	320	320	400	200	100	150	330	350

(i) Compute the median and variance for these sample data. (5 marks)

(ii) Calculate the coefficient of variation for these sample data. (2 marks)

(b) Following is the price and quantity information for Veeco Company in year 2015 and 2019.

Type	2015		2019	
	Price (RM)	Quantity ('000)	Price (RM)	Quantity ('000)
Radio	100	20	120	15
Toaster	200	40	250	25
Clock	130	30	130	50
Hair dryer	225	10	250	10

(i) Compute Laspeyres Price Index for 2019 by using 2015 as the base period. (3 marks)

(ii) Compute Paasche Quantity Index for 2019 by using 2015 as the base period. (3 marks)

(c) A basketball team is to play two games in a tournament. The probability of winning the first game is 0.1. If the first game is won, the probability of winning the second game is 0.15. If the first game is lost, the probability of winning the second game is 0.25. What is the probability the first game was won if the second game is lost? (4 marks)

(d) The content, in milligrams, of the vitamin C in a litre carton of cranberry juice can be modelled by a normal distribution with a mean of 32 and a standard deviation of 2.

(i) Determine the probability that, for a carton chosen at random, the vitamin c content is less than 30 mg. (3 marks)

(ii) Find, to the nearest milligram, the value of the mean required to ensure that the percentage of cartons with a vitamin C content of less than 30 mg is 2.5. (5 marks)

(Total: 25 Marks)

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QUESTION 2

(a) A traffic engineer conducted a study on the average daily traffic at Melaka-Muar location for the first half of 2019. His result show that the average daily traffic is 15730 vehicles with standard deviation of 650 vehicles for a sample size of 120 days.

(i) Construct a 95% confidence interval for the population mean of the average daily traffic at Melaka-Muar location. (6 marks)

(ii) Ministry of Works reported that the average daily traffic at Melaka-Muar location was 15640 in year 2016. Test whether the population mean of the average daily traffic at Melaka-Muar location for the first half of 2019 is higher than 15640 at significance level of 5%. (8 marks)

(b) A recent survey was conducted on the acceptance rate of e-hailing services. The details of the survey are as following:

Gender	Male	Female
Sample size	100	80
e- hailing users	52	38

If the test is to be conducted using a 5% level of significance, can we conclude that there is a difference between gender on e-hailing services' acceptance rate? (11 marks)

(Total: 25 Marks)

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QUESTION 3

(a) The manager of a food delivery service company would like to assess the performance of the riders in his company. He has collected the required data from a sample of five riders. The objective of his study is to investigate whether there is any difference in the average of food delivery time spent among the riders. The collected data was analysed and the partially completed ANOVA table is presented below:

Groups	Count	Sum	Average	Variance
Rider 1	15	683	45.5333	9.8381
Rider 2	15	633	42.2	17.6
Rider 3	15	625	41.6667	28.5238
Rider 4	15	650	43.3333	22.6667
Rider 5	15	648	43.2	33.1714

ANOVA

Source of Variation	*SS*	*df*	*MS*
Between Groups	***	***	***
Within Groups	1565.2	70	***
Total	***	74	

(i) Compute the sum of squares between groups (SSB) and then complete the ANOVA table. (7 marks)

(ii) If all the populations have equal variances and are normally distributed, is there any difference in the average food delivery time spent for these five riders at 5% significance level? (7 marks)

(b) A marketer would like to study the relationship of age group and the adoption of e-wallet among consumers in Malaysia. He has collected a sample of data as shown below to be used in the study:

Age group	Using of e-wallet	
	Yes	No
Less than 21 years old	36	9
21 to 30 years old	103	23
31 to 40 years old	79	22
41 to 50 years old	62	16
More than 50 years old	40	10

Test whether the age group is related to the adoption of e-wallet in Malaysia at 0.01 significance level. (11 marks)

(Total: 25 Marks)

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QUESTION 4

(a) The manager of a company believes that the sales generated by a sales representative is related to their length of service with the company. He has gathered the information on eight sales representatives of the company as given in the following table.

Length of Service (years)	6	4	1	12	15	18	9	10
Sales (RM thousands)	68	50	42	95	90	78	82	87

(i) Form an equation of the regression line. (6 marks)

(ii) Compute the coefficient of correlation. (4 marks)

(b) The cosmetic and toiletries industry has grown rapidly in the country. Owing to this, a local cosmetic company wish to study the factors that influence consumers' purchase intention towards their products. A total of 50 customers were interviewed. The collected data was then analysed using multiple regression analysis. The following are the partially completed computer generated output:

ANOVA

	df	*SS*	*MS*	*F*
Regression	***	***	***	***
Residual	***	88.276	***	
Total	49	289.453		

	Coefficient	t-Stat
Intercept	0.308	
Brand awareness	0.310	2.089
Brand association	0.367	2.496
Perceived quality	0.479	3.307
Brand loyalty	0.277	2.038

(i) Complete the ANOVA table. (4 marks)

(ii) Test whether the regression model is statistically significant at 5% significance level. (6 marks)

(iii)Test the regression coefficients individually. Use 0.05 significance level. (5 marks)

(Total: 25 Marks)

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APPENDIXES:

I. STATISTICAL FORMULAE

A. DESCRIPTIVE STATISTICS

Ungrouped Data:

Sample Mean, $\bar{x} = \frac{\sum x}{n}$ Sample Standard Deviation, $s = \sqrt{\frac{\sum x^2}{n-1} - \frac{(\sum x)^2}{n(n-1)}}$

Grouped Data:

Sample Mean, $\bar{x} = \frac{\sum fx}{\sum f}$ Sample Standard Deviation, $s = \sqrt{\frac{\sum fx^2}{\sum f - 1} - \frac{(\sum fx)^2}{\sum f(\sum f - 1)}}$

Median $= L_m + \left[\frac{\left(\frac{\sum f}{2} - F_{m-1}\right)}{f_m}\right]c$ Mode $= L_m + \left[\frac{(f_m - f_{m-1})}{2f_m - f_{m-1} - f_{m+1}}\right]c$

B. PROBABILITY DISTRIBUTION

Poisson Probability Distribution

If X follows a Poisson Distribution P (λ) where $P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$

then the mean = E(X) = λ and variance = VAR(X) = λ

Binomial Probability Distribution

If X follows a Binomial Distribution B(n, p) where $P(X = x) = {}^nC_x p^x q^{n-x}$

then the mean = E(X) = np and variance = VAR(X) = npq where $q = 1\text{-}p$

Normal Distribution

If $X \sim N(\mu, \sigma)$ where E(X) = μ and VAR(X) = σ^2, then $Z = \frac{X - \mu}{\sigma}$

C. CONFIDENCE INTERVAL ESTIMATION AND SAMPLE SIZE DETERMINATION

If σ known, $(100 - \alpha)\%$ Confidence Interval for Population Mean, μ: $\bar{x} \pm Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$

If σ unknown, $(100 - \alpha)\%$ Confidence Interval for Population Mean, μ: $\bar{x} \pm t_{\alpha/2,n-1}\frac{s}{\sqrt{n}}$

$(100-\alpha)\%$ Confidence Interval for Population Proportion, π: $p \pm Z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}}$

Sample Size Determination for Population Mean: $n = \frac{(Z_{\alpha/2})^2\sigma^2}{E^2}$

Sample Size Determination for Population Proportion: $n = \frac{(Z_{\alpha/2})^2 p(1-p)}{E^2}$

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D. HYPOTHESIS TESTING

One Sample Mean Test

***Z*-test:** $Z = \dfrac{\bar{x} - \mu}{\dfrac{\sigma}{\sqrt{n}}}$ ***t*-test:** $t = \dfrac{\bar{x} - \mu}{\dfrac{s}{\sqrt{n}}}$

One Sample Proportion Test

$$Z = \frac{p - \pi}{\sqrt{\dfrac{\pi(1-\pi)}{n}}}$$

Two Sample Mean Test

***Z*-test:** $Z = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}}$

***t*-test:** $t = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_p\sqrt{\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}}$ where $s_p = \sqrt{\dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$

Two Sample Proportion Test

$$Z = \frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\sqrt{\bar{p}(1-\bar{p})\left[\dfrac{1}{n_1} + \dfrac{1}{n_2}\right]}} \quad \text{where} = \bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

E. ANALYSIS OF VARIANCE

$$SST = \sum_{i=1}^{k}\sum_{j=1}^{n_j}\left(X_{ij} - \bar{\bar{X}}\right)^2 \qquad SSB = \sum_{i=1}^{k} n_i\left(\bar{X}_i - \bar{\bar{X}}\right)^2$$

$$SSW = \sum_{i=1}^{k}(n_i - 1)s_i^2 \quad \text{or} \quad SSW = \sum_{i=1}^{k}\sum_{j=1}^{n_j}(x_{ij} - \bar{x}_i)^2$$

F. CHI-SQUARE ANALYSIS

Expected cell frequencies for Independent Test: $E_i = \dfrac{Row\ total \times Column\ total}{N}$

Chi-Square test statistic: $\chi^2 = \sum \dfrac{(O_i - E_i)^2}{E_i}$

O_i = Observed frequency in a particular cell

E_i = expected frequency in a particular cell

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G. REGRESSION ANALYSIS

Correlation Coefficient: $$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Simple Linear Regression: $Y = a + bX$ where $$b = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}}$$ and

$$a = \bar{y} - b\bar{x}$$

H. INDEX NUMBERS

Simple Price Index $P = \frac{p_t}{p_0} \times 100$	**Laspeyres Quantity Index** $P = \frac{\sum p_0 q_t}{\sum p_0 q_0} \times 100$
Simple Aggregate Price Index $P = \frac{\sum p_t}{\sum p_0} \times 100$	**Paasche Quantity Index** $P = \frac{\sum p_t q_t}{\sum p_t q_0} \times 100$
Laspeyres Price Index $P = \frac{\sum p_t q_0}{\sum p_0 q_0} \times 100$	**Fisher's Ideal Price Index** $\sqrt{(\text{Laspeyres Price Index})(\text{Paasche Price Index})}$
Paasche Price Index $P = \frac{\sum p_t q_t}{\sum p_0 q_t} \times 100$	**Value Index** $V = \frac{\sum p_t q_t}{\sum p_0 q_0} \times 100$

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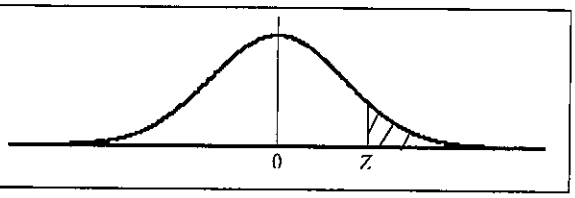
II. STATISTICAL TABLE

Table 1
The Upper Tail Area Under the Standard Normal Curve



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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